

Re: Christmas Light Puzzler – HELP

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- *From:* Jeff Liebermann <jeffl@xxxxxxxxxxx>
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"James Sweet" <jamessweet@xxxxxxxxxxx> hath wroth:

A better question would be why are your bulbs burning out? It might be that the safety features is actually doing its job and preventing a meltdown. 2500 bulbs belches quite a bit of heat. Before you disarm the safety features, do some calculating:

Each bulb burns about 1/2 watt. 2500 lights burn about 1250 watts, most of which goes up in heat, not light. That's quite a bit of heat that has to go somewhere. My guess(tm) is that your tree is overloaded with lamps and they are blowing because they're getting too hot.

No way, incandescent lamps will work fine in environments hot enough to burn the insulation off the wires. Unless the tree is on fire, heat will absolutely not cause these lamps to fail.

True. Heat does not cause the lamp to fail, but does aggravate the problem. Although the author does not specifically mention the obvious, the hotter the bulb, the faster the evaporation, and therefore, the faster the failure.

<<http://members.misty.com/don/bulb1.html>>

How light bulbs burn out.

Due to the high temperature that a tungsten filament is operated at, some of the tungsten evaporates during use. Furthermore, since no light bulb is perfect, the filament does not evaporate evenly. Some spots will suffer greater evaporation and become thinner than the rest of the filament.

These thin spots cause problems. Their electrical resistance is greater than that of average parts of the filament. Since the current is equal in all parts of the filament, more heat is generated where the filament is thinner. The thin parts also have

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less surface area to radiate heat away with. This "double whammy" causes the thin spots to have a higher temperature. Now that the thin spots are hotter, they evaporate more quickly.

It becomes apparent that as soon as a part of the filament becomes significantly thinner than the rest of it, this situation compounds itself at increasing speed until a thin part of the filament either melts or becomes weak and breaks.

This is not rocket science, bulbs burn out, connections in sockets get bad, series wired lights are notorious for problems like this. Additionally, as each lamp fails and shunts, the voltage across the remaining lamps increases and if left unchecked they'll start to burn out too. More than once I've had this cascade in smaller strings to the point that every lamp burned out until the fuse in the plug opened.

I haven't. There are usually 50 bulbs in series. When the Noma "Stay-Lit" bulbs blow up, a roughly 5 ohm shunt ends up across the bulb. With 50 bulbs, it would take quite a few bulbs to blow, before the current would creep up to the point where the others might blow.

<<http://christmas.howstuffworks.com/christmas-lights2.htm>>

<<http://www.planetchristmas.com/Minis.htm>>

However, if your lamp string use some other method of maintaining operation, such as shorting instead of introducing a 5 ohm shunt, then it might blow the other bulbs.

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